WoT Thing Description Protocol Binding Template for OCF

Michael J Koster

June 8, 2017

Protocol Binding

- Maps abstract operations on WoT meta types to concrete operations on target resources
- WoT
  - Properties (get, set)
  - Actions (invoke, cancel)
  - Events (subscribe, unsubscribe)
- OCF
  - CRUD+N Resource Model, resource types, interface types, collections, actuation

Protocol Binding Template

- A specification for the information included in a particular protocol binding, and its format
- TD Interaction Description contains information common to all protocol bindings
- Protocol Binding contains information needed to make requests and process responses
- Protocol Binding Template indicates which information is included for a particular protocol

Thing Description (simplified)

Interaction Description

Protocol Binding

```
{
  "semtype": ["thing", "sch:light"],
  "name": "Example Light Thing",
  "interactions": [
    {
      "semtype": ["action", "sch:setlevel"];
      "name": "set brightness level",
      "inputdata": {
        "type": "number"
        "semtype": "sch:level"
      },
      "links": [
        { "href": "/example/light" },
        {...}
      ]
    },
  ]
}
```

OCF Protocol Binding Structure

- Basic form of a hypermedia control, extension to the "links" property
  - link attributes describe high level operations
  - method, interface type, resource type, schema mapping to input/output data in TD
- Properties included in the OCF Protocol Binding
  - method (ocf.retrieve, ocf.update…)
  - rt - resource type
  - if - interface type
  - mediatype (default "application/vnd.ocf+cbor")
  - schemas for inputdata/outputdata element

TD – Interaction Description

JSON Schema
+ Extension

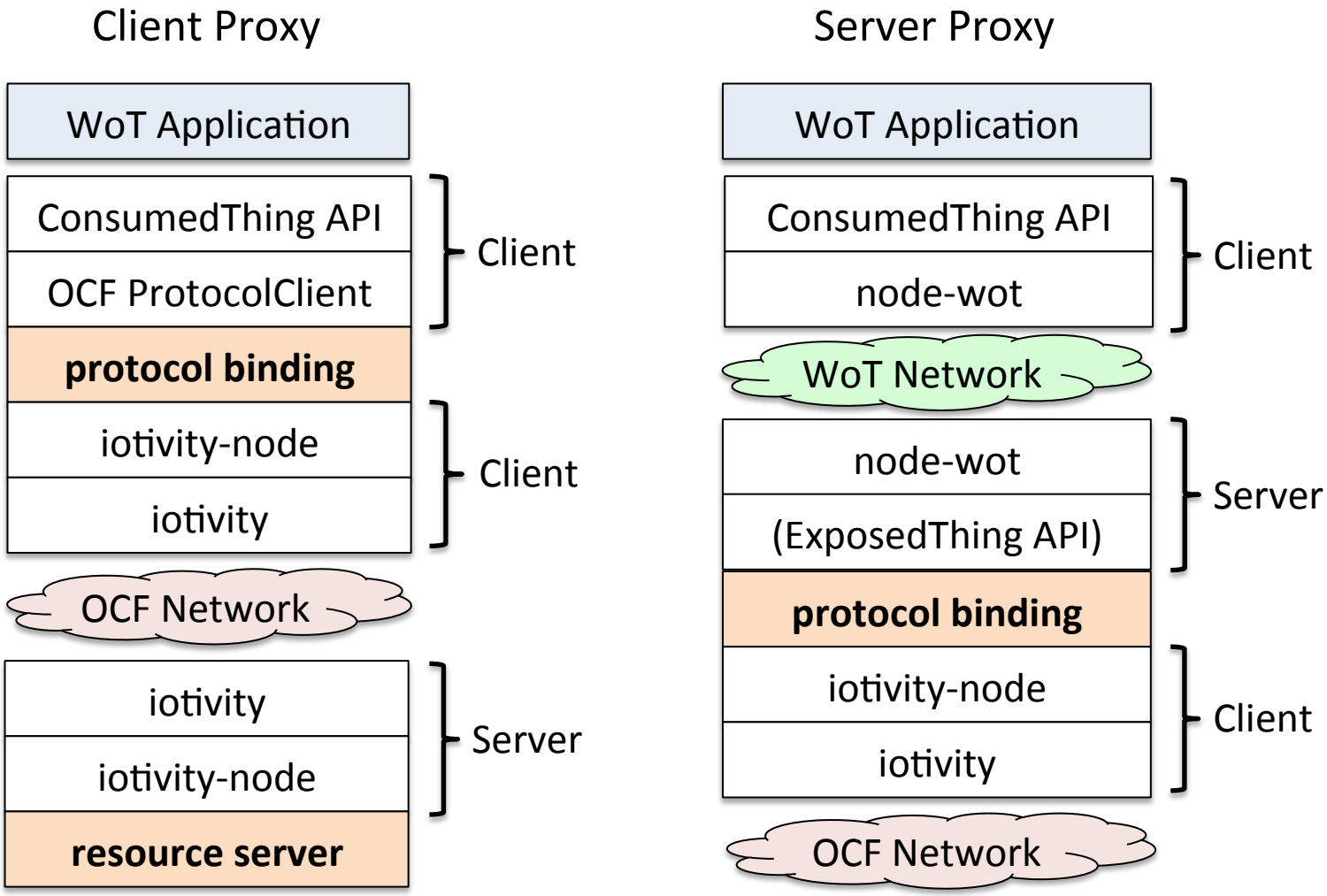
```
{
  "semtype": ["action", "sch:setlevel"];
  "name": "set brightness level",
  "inputdata": {
    "type": "object"
    "properties": {
      "P0001": {
        "type": "number",
        "semtype": "sch:level"
      },
      "P0002": {
        "type": "number",
        "semtype": "sch:transitiontime"
      }
    }
  },
  "links": [
    (protocol binding goes here)
  ]
}
```

TD - Protocol Binding

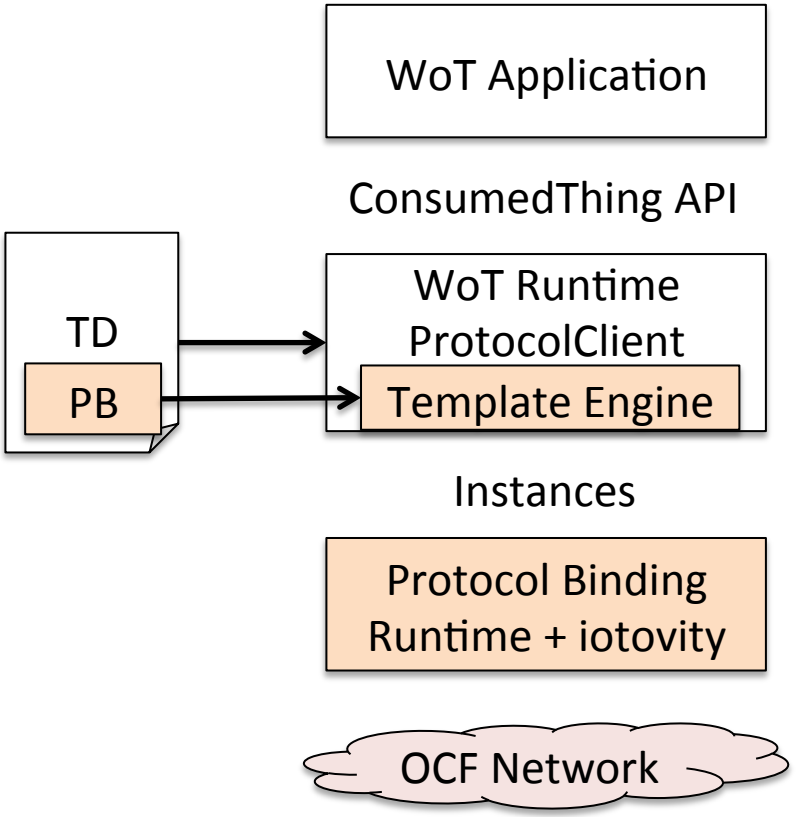
```
links: [
  {
    "href": "/example/light/brightness",
    "mediatype": "application/vnd.ocf+cbor",
    "method": "ocf.update",
    "rt": ["oic.r.brightness", "oic.r.ramptime"],
    "if": ["oic.if.a"],
    "inputschema": {
      "type": "object",
      "properties": {
        "brightness": {
          "value": "{{P0001}}"
        },
        "ramptime": {
          "value": "{{P0002}}"
        }
      }
    }
  }
]
```

JSON Schema + Extension

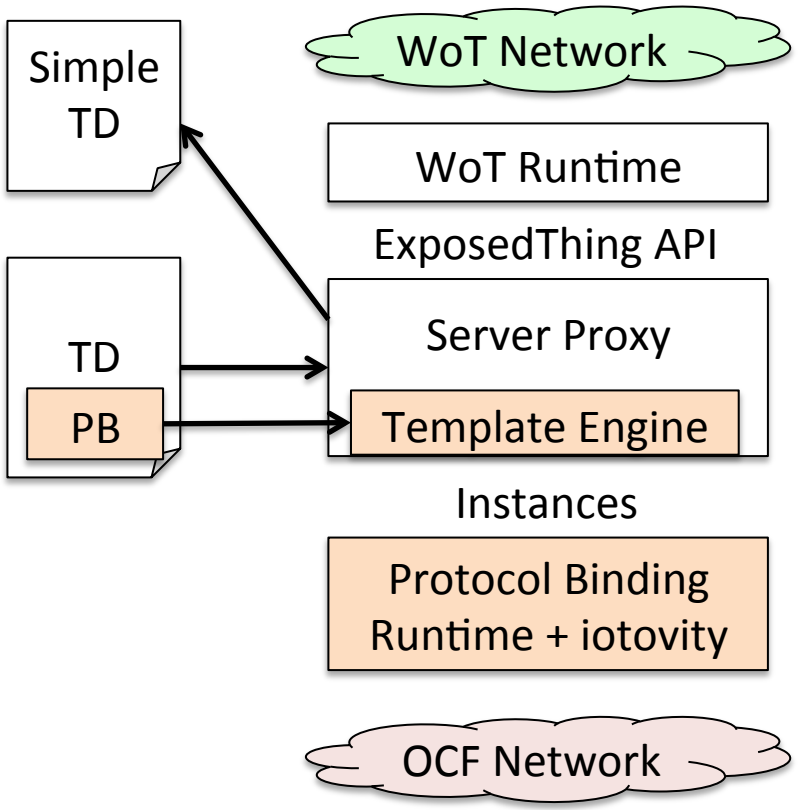
Integration Patterns



Protocol Binding Processing for Client Proxy Pattern



Protocol Binding Processing for Server Proxy Pattern



Discovery

- Applications discover things using TD templates containing semantic constraints
- TD instances could be pre-generated for all OCF discovered devices, and registered with a TD discovery service
- New devices could be registered upon OCF discovery
- Alternatively, OCF discovery queries could be mapped from Thing Descriptions and submitted on demand

Mapping OCF to WoT

- OCF Device maps to Wot Thing
- An OCF device contains a set of resource type instances
- An OCF resource type instance contains a set of properties
- Multiple properties may be retrieved or updated in a single interaction, e.g. a value and a time stamp
- OCF properties map to TD properties
- Some OCF properties map to TD property value attributes (min, max, step, units)

Mapping OCF to TD Actions

- With OCF, Actions are invoked using updates to properties
- Multiple properties may be updated in a request, for example light brightness and ramp time, by sending a structure
- OCF does not define actions per se

Capability-based mapping

- Capabilities are Action, Event, and Property definitions for a single function
- On/off control is a capability with an on/off boolean state property, and either an on action and an off action, or a state change action that has a boolean input parameter
- Level control is a capability with level and transition time properties, and a setlevel action with level and transitiontime input parameters

Capability-based mapping

- An OCF light exposes a binary switch resource, a brightness control resource, and a ramp time resource
- OnOff and level capabilities can be used to map the binary switch and brightness + ramptime resources, respectively
- TD exposes the properties and actions for onoff and level, and maps them to the OCF resources and methods

Examples

Examples in this presentation may be found in:

https://github.com/mjkoster/wot-protocol-binding